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(71) Applicant: **Advanex Inc.**
Tokyo 114-8581 (JP)

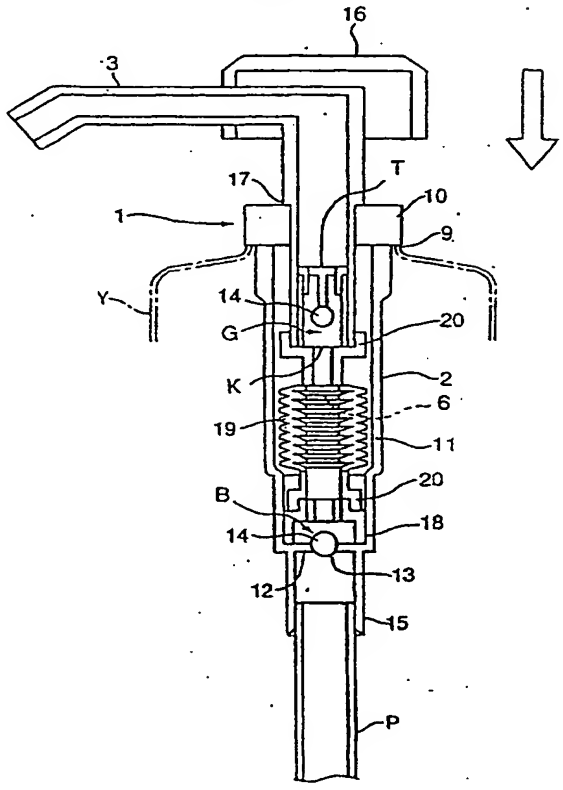
(72) Inventors:
- **CHIKASHIGE, Kiyoshi, Advanex Inc.**
Tokyo 114-8581 (JP)
- **MIZUOCHI, Akira, Advanex Inc.**
Tokyo 114-8581 (JP)

(74) Representative: **Ilgart, Jean-Christophe et al**
BREVALEX
3, rue du Docteur Lanceraux
75008 Paris (FR)

(54) VALVE UNIT AND CONTAINER

(57) A valve unit and container are provided that facilitate assembly work, are easily recycled and can be manufactured at low cost. Namely, a pipe-shaped piston section 3 is slidably inserted into a pipe-shaped valve body 2 inserted into and detachably fitted to a container body Y, and a concertina-shaped bellows 19, which is able to regain its form in the direction of lengthening, connects the inside of piston section 3 with an opening 13 between the insertion end of piston section 3 and opening 13.

Fig. 1



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body is unitarily formed at a lower end of the bellows, the valve is provided in the bellows, the check valve is provided in the piston section, and in addition to the valve and check valve having plastic balls that block their respective valve seats, projections which prevent the balls of the valve and check valve from rising up may be unitarily formed in the bellows and piston section, respectively.

[0017] As a result of composing in this manner, in addition to it being possible to form the piston section, check valve, valve, bellows and pipes from plastic, the rising up of the balls during valve opening that occurs in the case the balls are formed from lightweight plastic can be prevented in comparison with steel balls and so forth. Here, the above balls are not necessarily required to be spherical, and also refer to balls that are bowl-shaped or hemispherical.

[0018] In addition, in the above valve unit, the check valve and the projection that prevents the ball from rising may be formed unitarily in the bellows.

[0019] As a result of composing in this manner, the projection can be formed simultaneous to forming of the bellows.

[0020] In addition, in the above valve unit, the bellows, piston section and pipe are formed unitarily into a bellows unit, the valve and check valve are provided in this bellows unit, and the projections which prevent the respective balls from rising up are unitarily formed corresponding to the valve and the check valve.

[0021] As a result of composing in this manner, the bellows having the above valve and check valve, the piston section and the pipe can be formed simply by forming the bellows unit.

[0022] In addition, in the above valve unit, a back flow prevention body may be detachably installed on the intake end of the pipe or above the check valve that prevents back flow of liquid within the pipe when the pipe is upside down.

[0023] As a result of composing in this manner, outflow of liquid over the intake end of the pipe or above the check valve can be prevented by the back flow prevention body even when the pipe is upside down.

[0024] In addition, in the above valve unit, a narrow diameter section may be formed part way along the above pipe that prevents back flow of liquid within the pipe when the pipe is upside down.

[0025] As a result of composing in this manner, outflow of liquid within the pipe can be prevented by the narrow diameter section when the pipe is upside down.

[0026] A valve unit according to another mode of the present is characterized by comprising a pipe-shaped piston section slidably inserted into a pipe-shaped valve body inserted into and detachably fitted to a container body, a liquid container unit formed between an intake port of the valve body and an intake end of the piston section and which communicates with the atmosphere via the piston section, a valve which restricts outflow of liquid from the liquid container unit to the container body on the intake port side of the liquid container unit, a check valve which restricts back flow of liquid from the piston section to the liquid container unit that is provided between a discharge end of the piston section and a discharge side of the liquid container unit, the piston section being urged, with respect to the valve body, in a direction which increases the volume of the liquid container unit, a magnet which is attached to a piston that is attached to the intake end of the piston section and that slidably contacts the inside of the valve body, and a magnet attached to the liquid container unit side of the valve, each magnet being arranged so that like poles are mutually opposed.

[0027] As a result of composing in this manner, when the piston section is pressed when there is no liquid in the liquid container unit, although the valve closes since air in the liquid container unit is compressed, when air inside is attempted to be discharged, the check valve opens and air is discharged.

[0028] When the piston section is released, since the piston section regains its shape in the direction of lengthening due to the magnets mutually repelling, negative pressure is generated inside the liquid container unit. Whereupon, the check valve closes, and accompanying movement by piston, the valve opens and liquid is drawn into the liquid container unit from the container body, thereby filling the liquid container unit.

[0029] Next, when the piston section is pressed again, since liquid in the liquid container unit is prevented from moving into the container body by the valve, the liquid, which has no where to escape, opens the check valve and is expelled from the liquid container unit that has a smaller volume due to the operation of the piston, and liquid in the pressed piston section is expelled to the outside from the piston section without flowing back into the liquid container unit by the check valve. Here, one of the magnets can be attached to the piston section, and the other magnet can be attached to the liquid container unit side of the valve, and each of the magnets can be unitarily assembled.

[0030] In addition, the above magnets in the above valve unit may be plastic magnets.

[0031] As a result of composing in this manner, the valve body, piston section, check valve and valve can also be formed from plastic.

[0032] In addition, in the above valve unit, the check valve may be provided on the discharge end side of the piston section, and may be a flexible section that presses against and blocks the discharge end side of the piston when negative pressure is generated inside the piston section.

[0033] As a result of composing in this manner, when liquid attempts to flow back from the piston section into the liquid container unit, the flexible section functions as a check valve by pressing against and blocking the inside of the piston section.

[0034] In addition, in the above valve unit, a separable constitution may be employed for the above bellows,

is prevented. The above opening 13, ball 14 and bottom wall 12 compose valve B. Furthermore, insertion section 15 for pipe P that extends into container body Y is formed on the lower end of cylindrical section 11.

[0045] The above piston section 3 is a pipe-shaped member that is formed roughly into the shape of the letter "L", and as previously described, the lower half is slidably inserted into the above valve body 2 from upper flange 10 of valve body 2, while the end of the upper end that extends horizontally starting at the bent section is bent slightly downward on an angle.

[0046] Here, pushing section 16 is formed on the bent section of piston section 3. In addition, ledge 17 is formed around the lower half of the above piston section 3, and this ledge 17 engages with upper flange 10 of the above valve body 2 so that piston section 3 is not inserted beyond a fixed length. Here, check valve G is inserted and fixed in the intake end on the lower end of piston section 3. Since ball 14 is housed in a cylindrical member, this check valve G allows outflow of liquid while restricting the upward movement of ball 14 by, for example, tube T having a cross-shaped slit. Ball 14 restricts back flow of liquid from piston section 3 into liquid container unit 6 by blocking opening K of joint 20 on the upper side.

[0047] Here, although an explanation has been provided of the case in which ball 14 of the above valve B and ball 14 of check valve G are spherical, the balls are not necessarily required to be spherical, but rather may be bowl-shaped or hemispherical (and this applies similarly to other embodiments as well).

[0048] On the other hand, cylindrical bracket 18 around opening 13 on bottom wall 12 of valve body 2 fits into above valve body 2, and concertina-shaped bellows 19 made of plastic, which connects the inside of piston section 3 and opening 13, and which is able to regain its form in direction of lengthening, is connected between this bracket 18 and the lower end of the above piston section 3.

[0049] Thus, the inside of this bellows 19 is composed in the form of liquid container unit 6. Here, the above bellows 19 is urged in the direction of lengthening, namely the direction in which the volume of its inside increases. Furthermore, although joints 20 respectively attached to piston section 3 and bracket 18 are formed on the upper and lower ends of bellows 19, at least one of these may be unitarily formed or unitarily assembled with the connected site.

[0050] According to the above embodiment, as shown in FIG. 1, in the state in which there is no liquid in bellows 19, when pushing section 16 of piston section 3 is pressed down, although valve B closes since the air in bellows 19 is expelled accompanying the compression of bellows 19, when the air inside is attempted to be discharged, check valve G opens and air is discharged from piston section 3.

[0051] As shown in FIG. 2, when pushing section 16 of piston section 3 is released, since bellows 19 attempts to regain its shape in the direction of lengthening, negative pressure is formed inside bellows 19. Whereupon, check valve G closes, ball 14 of valve B opens opening 13 accompanying the return of piston section 3, and liquid is drawn into bellows 19 from container body Y resulting in bellows 19 being filled with liquid.

[0052] Next, as shown in FIG. 1, when pushing section 16 of piston section 3 is pressed again, since liquid within bellows 19 is prevented from moving to the side of container body Y as a result of ball 14 of valve B blocking opening 13, the liquid is made to push up ball 14 of check valve G by compressed bellows 19 and is expelled through opening K, while liquid inside the pushed up piston section 3 is expelled to the outside through the upper end of piston section 3 without flowing back to container body Y due to valve B.

[0053] Thus, since bellows 19 can be unitarily formed and assembled into a single unit with piston section 3 or bracket 18, assembly work is easy and bellows 19 can be manufactured at low cost. In addition, since bellows 19, piston section 3 and valve body 2 can be processed together since they are all made of plastic, recycling is easy.

[0054] Here, since it is not necessary in this embodiment to provide a piston that is made to slide into the inner periphery of valve body 2 on the lower end of piston section 3, and it is not necessary to provide an air venting hole in the cylindrical section as in the second and sixth embodiments to be described later, forming is easy, thereby making this advantageous.

[0055] Next, an explanation is provided of a second embodiment based on FIG. 3 by assigning the same reference symbols corresponding to the same sections of the above-mentioned first embodiment.

[0056] This embodiment eliminates the above-mentioned bracket 18 in the above first embodiment, positions ball 14 of valve B in the lower section of bellows 19, and inserts and fixes the upper section of bellows 19 in the lower end of piston section 3 by means of a tube T. In addition, check valve G, which is able to open and close opening K with ball 14, is unitarily formed in the upper section of bellows 19. The above pipe P is unitarily formed in the lower end of bellows 19. In other words, bellows 19, valve B, check valve G and an intake port in the form of pipe P in the above embodiment are unitarily formed.

[0057] Thus, this embodiment offers the advantages of being able to significantly reduce the number of parts while also facilitating assembly.

[0058] Here, an explanation of a variation of this second embodiment, and more specifically a variation of check valve G, is provided according to FIGS. 4 through 8.

[0059] In FIG. 4, check valve G of the above second embodiment is formed with ball 14 and opening K part way along piston section 3. In addition, instead of providing tube T, communication hole R is formed offset from the center in the bent section of the path within pis-

and 13, projections 25, which prevent ball 14 of valve B from rising upward, are unitarily formed on walls inside bellows 19 by forming the above constriction 19A on the peripheral edge between bellows 19 and valve chamber 12A. Furthermore, these projections 25 have the same constitution as the above projection 25 of check valve G. Here, these projections 25 achieve the object by giving the hole an irregular shape.

[0075] According to the above embodiment, in the state in which bellows 19 does not contain liquid, when pushing section 16 of piston section 3 is pressed down (FIGS. 14 and 15), although valve B closes due to air inside bellows 19 being expelled accompanying bellows 19 being compressed, when the air inside is attempted to be discharged, check valve G opens and the air is discharged from piston section 3.

[0076] As shown in FIG. 16, when pushing section 16 of piston section 3 is released, since bellows 19 attempts to regain its form in the direction of lengthening, negative pressure is generated inside bellows 19. Whereupon, check valve G closes, ball 14 of valve B opens valve seat 12B accompanying the return of piston section 3, liquid is drawn in from pipe P from container body Y to bellows 19, and bellows 19 is filled with liquid. At this time, although plastic ball 14 of valve B seems like it would rise upward due to its light weight, since upward movement is effectively restricted by projections 25, it is able to prepare for the next valve closing operation.

[0077] Next, as shown in FIG. 17, when pushing section 16 of piston section 3 is pressed again, since liquid inside bellows 19 is prevented from moving into container body Y by ball 14 of valve B blocking valve seat 12B, liquid pushes up ball 14 of check valve G due to compression of bellows 19, liquid is expelled due to opening of the flow path inside piston body 3A, and the expelled liquid inside piston section 3 is expelled to the outside from the upper end of piston section 3 without flowing back into container body Y due to valve B that blocks valve seat 12B. At this time, although it seems that plastic ball 14 of check valve G would rise upward due to its light weight, since its upward movement is effectively restricted by projections 25, it can prepare for the next valve closing operation.

[0078] Thus, piston body 3A can be molded with plastic in entirety since ball 14 of check valve G is molded with plastic. In addition, since bellows 19 as well as ball 14 of valve B are also molded with plastic, the entire structure can be molded with plastic together with pipe P. Accordingly, the entire structure can be processed without having to separate, thereby facilitating recycling.

[0079] In addition, since valve seat 26 and projection 25 in check valve G are unitarily formed with piston body 3A, and pipe P, projections 25 and valve chamber 12A in bellows 19 are formed unitarily, the number of man-hours required for assembly work can be reduced, and the valve unit and container can be manufactured at low cost.

[0080] Next, FIG. 18 shows a fourth embodiment of the present invention.

[0081] This embodiment unitarily forms piston body 3A and bent section 3B in the above third embodiment into an integrated piston section 3, and provides check valve G in the above third embodiment on the bellows 19 side. Namely, the section from pipe P to bellows 19 and to piston section 3 is composed of two parts, which is fewer parts than the third embodiment in which this section is composed of three parts.

[0082] The above check valve G and valve B are provided in bellows 19. Valve B has a similar constitution as in the previous embodiment, while plastic ball 14 and projection 25 of check valve G are again unitarily formed with bellows 19, with ball 14 blocking valve seat 26.

[0083] Here, this bellows 19 is assembled by pushing in the two balls 14 of check valve G and valve B, and ball 14 of check valve G has a larger diameter than ball 14 of valve B (and this applies similarly in FIGS. 19A, 19B and 22 of the fifth embodiment). Furthermore, since the constitutions of other components are the same as in the above third embodiment, the same reference symbols are used for the same components, and their explanations are omitted.

[0084] Thus, according to the above embodiment, since balls 14 of check valve G and valve B are molded with plastic, and because of this, they can be prevented from rising upward by projections 25, they can be recycled easily while also offering the effect of allowing balls 14 of check valve G and valve B to operate smoothly. Since the section from pipe P to bellows 19 and piston section 3 is composed of two parts, the number of parts can be further reduced, resulting in a greater decrease in man-hours required for assembly, while also offering the effect of reduced costs.

[0085] Next, FIGS. 19A, 19B and 20 through 22 show a fifth embodiment of the present invention.

[0086] As shown in FIG. 19A, this embodiment unitarily forms piston section 3 and bellows 19 in the fourth embodiment. Namely, the section from pipe P to bellows 19 and piston section 3 is composed with a single part in the form of bellows unit 27, resulting in fewer parts than the fourth embodiment in which this section is composed of two parts.

[0087] Since the basic structure of bellows 19, including the providing of the above check valve G and valve B, is similar to that of the above fourth embodiment, the same reference numerals are used to indicate the same components, and its explanation is omitted. Here, bellows unit 27 is unitarily provided with pipe P, valve chamber 12A, bellows 19 and piston section 3, and a concertina section 28 shown in FIG. 22 is formed at the location serving as the bent portion in piston section 3. This concertina section 28 is provided after forming so as to facilitate bending, and pushing member 16A is inserted and fixed at this location as shown in FIGS. 20 and 21. Furthermore, a thin-walled section having thinner walls than other sites may be formed instead of the above

opening K and is expelled into piston section 3 through communication hole 24A of plastic magnet 24 from liquid container unit 6 that has a smaller volume due to the operation of piston 22, and the expelled liquid in piston section 3 is expelled to the outside from piston section 3 without being allowed to flow back into liquid container unit 6 by check valve G.

[0102] Thus, since it become possible to unitarily assemble each magnet, by assembling the plastic magnets 24 in piston 22 and the plastic magnet 23 in the bracket 18 on the side of liquid container unit 6, the number of man-hours required for assembly and the number of parts can be decreased and manufacturing costs can be reduced in comparison with the case of using a coil spring.

[0103] In addition, since the above magnets 23 and 24 are plastic magnets, they can be molded with plastic together with valve body 2, piston section 3, check valve G and valve B, thereby facilitating recycling.

[0104] This also makes it possible to reduce the number of parts and man-hours required for assembly for the entire container comprising container body Y and valve unit 1, while also facilitating recycling.

[0105] Next, an explanation is provided of a seventh embodiment with reference to FIGS. 25 through 27. Here, this embodiment and the eighth embodiment have check valve G of the previously mentioned third embodiment shown in FIG. 9 formed unitarily in the manner of valve B. Accordingly, the same reference symbols are used to indicate those constituent parts that are the same as FIG. 9, and their explanation is omitted. In addition, since these seventh and eighth embodiments relate to a variation of the above pipe P, they can also be applied to the other first, second and fourth through sixth embodiments.

[0106] In this embodiment, a plastic back flow prevention body 30 is detachably installed on the intake end of pipe P in each of the previous embodiments that prevents back flow of liquid in pipe P in the case pipe P is upside down. This back flow prevention body 30 is a cylindrical cap with a bottom that is placed over the intake end of pipe P to block it, and has a cross-shaped slit 32 formed in bottom wall 31. Although this slit 32 opens when acted on by negative pressure to draw in the above liquid, in the case pipe P, namely the entire container body Y, is turned upside down, the inflow of liquid into pipe P can be prevented.

[0107] Thus, even in the case pipe P, namely the entire container body Y, is upside down, since the flow of liquid at the intake end of pipe P can be prevented by back flow prevention body 30, overflow of liquid outside the container body due to back flow of liquid can be effectively prevented. Furthermore, the shape of the above slit 32 is not limited to the shape of a cross, but rather may be in the form of a dash or asterisk.

[0108] Next, an explanation is provided of an eighth embodiment according to FIGS. 28, 29, 30A and 30B. In this embodiment, as shown in FIGS. 28 and 29, a narrow diameter section 34 is formed part way along pipe P in each of the previously mentioned embodiments that prevents back flow of liquid in pipe P in the case pipe P is upside down. This narrow diameter section 34 is equipped with thin-walled diaphragm 35. Although this narrow diameter section 34 is able to expand by pressure and draw up liquid without hindrance in the case of drawing up the above liquid, in the case pipe P, namely the entire container body, is turned upside down, has a cross-sectional area that prevents liquid from flowing past diaphragm 35. Thus, since liquid inside pipe P is able to be prevented from flowing through this section by diaphragm 35 of narrow diameter section 34 in the case container body Y is upside down, the overflow of liquid outside the container body due to back flow of liquid can be effectively prevented.

[0109] In addition, FIGS. 30A and 30B show other modes of the eighth embodiment. Diaphragm 35 in FIG. 30A is formed in the shape of a cross-sectional slit as shown in FIG. 30B. In this state as well, although slit-shaped diaphragm 35 expands by pressure and takes in liquid in the case liquid is drawn in, in the case container body Y is upside down, since liquid inside pipe P can be prevented from flowing past this section by slit-shaped diaphragm 35 of narrow diameter section 34, overflow of liquid outside the container body due to back flow of liquid can be effectively prevented.

[0110] Furthermore, the present invention is not limited to the previously described embodiments, but rather for example, the variations of the check valve in the second embodiment (shown in FIGS. 4 through 8) can also be applied to the first and sixth embodiments.

[0111] In addition, a metal magnet or rubber magnet can be used instead of the plastic magnets in the sixth embodiment. In this case, by pre-assembling the magnets by insert molding, the number of parts and the number of man-hours required for assembly can be reduced.

Industrial Applicability

[0112] According to the valve unit of the present invention, a bellows can be unitarily formed and unitarily assembled with a piston or valve, thereby resulting in the effects of being able to manufacture the valve unit at low cost, while also facilitating assembly work and recycling.

[0113] In addition, a bellows, valve, check valve and intake port are formed unitarily, thereby resulting in the effect of being able to significantly reduce the number of parts.

[0114] In addition, in addition to being able form a piston section, check valve, valve, bellows and pipe from plastic, the rising up of a ball and so forth during valve opening, which occurs in the case of forming the ball and so forth from lightweight plastic in comparison with a steel ball, can be prevented, thereby resulting in the effects of facilitating recycling while also allowing the

take port of the valve body and an intake end of the piston section and which communicates with the atmosphere via the piston section, a valve which restricts outflow of liquid from the liquid container unit to the container body on the intake port side of the liquid container unit, a check valve which restricts back flow of liquid from the piston section to the liquid container unit that is provided between a discharge end of the piston section and a discharge side of the liquid container unit, the piston section being urged, with respect to the valve body, in a direction which increases the volume of the liquid container unit, a magnet which is attached to a piston that is attached to the intake end of the piston section and that slidably contacts the inside of the valve body, and a magnet attached to the liquid container unit side of the valve, each magnet being arranged so that like poles are mutually opposed.

9. The valve unit according to claim 8 wherein, the magnets are plastic magnets.

10. The valve unit according to any of claims 1, 2 or 9 wherein, the check valve is provided on the discharge end side of the piston section, and is a flexible section that presses against and blocks the discharge end side of the piston when negative pressure is generated inside the piston section.

11. The valve unit according to any of claims 5 through 7 wherein, a separable. constitution is employed for the bellows, piston section and pipe.

12. A container provided with a valve unit and container body according to any of claims 1 through 9.

13. A container provided with the valve unit and container body according to claim 10.

14. A container provided with the valve unit and container body according to claim 11.

Fig. 2

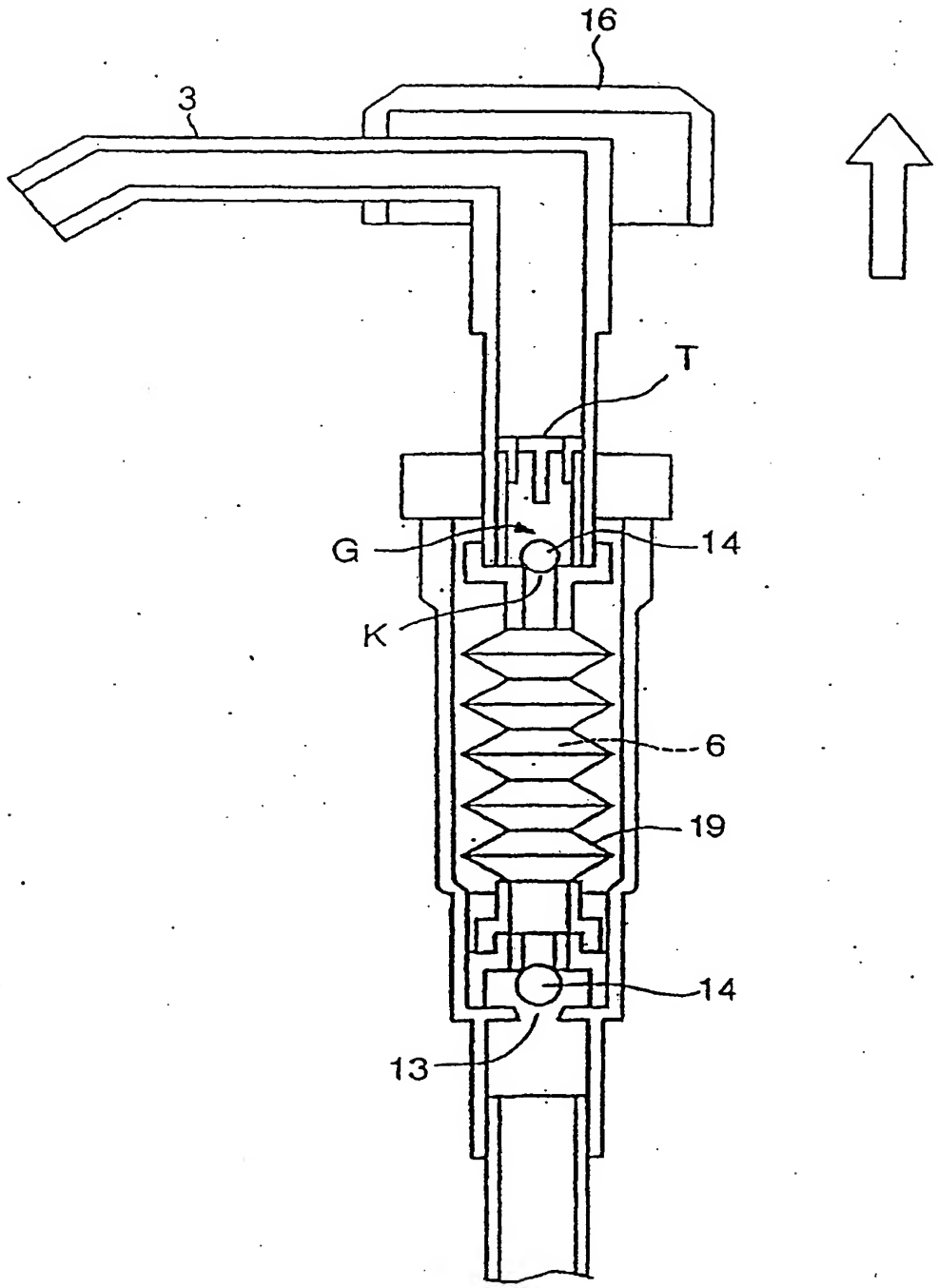


Fig. 4

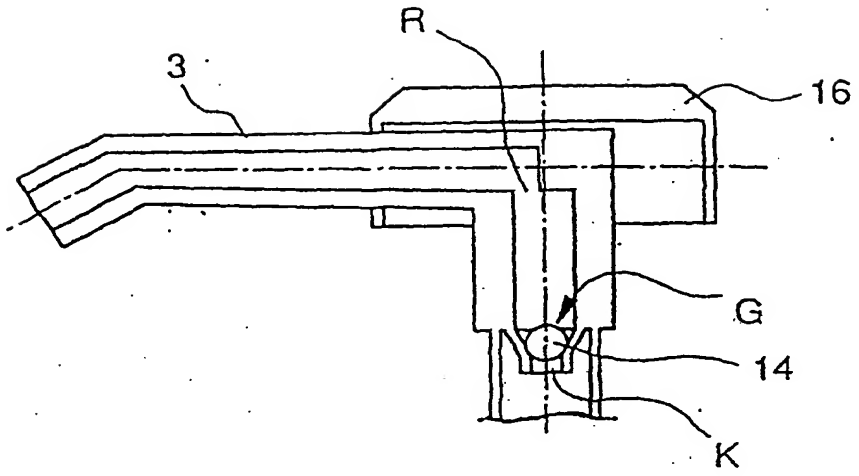


Fig. 5

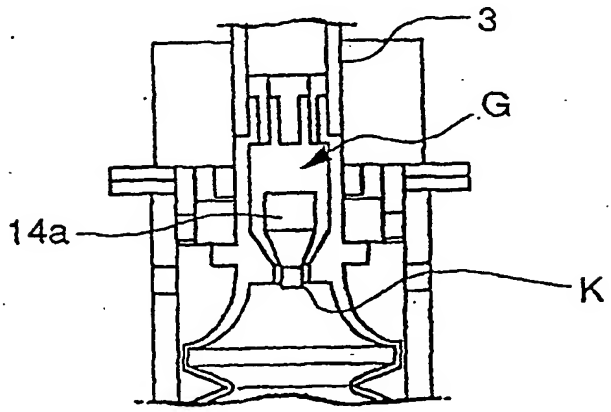


Fig. 9

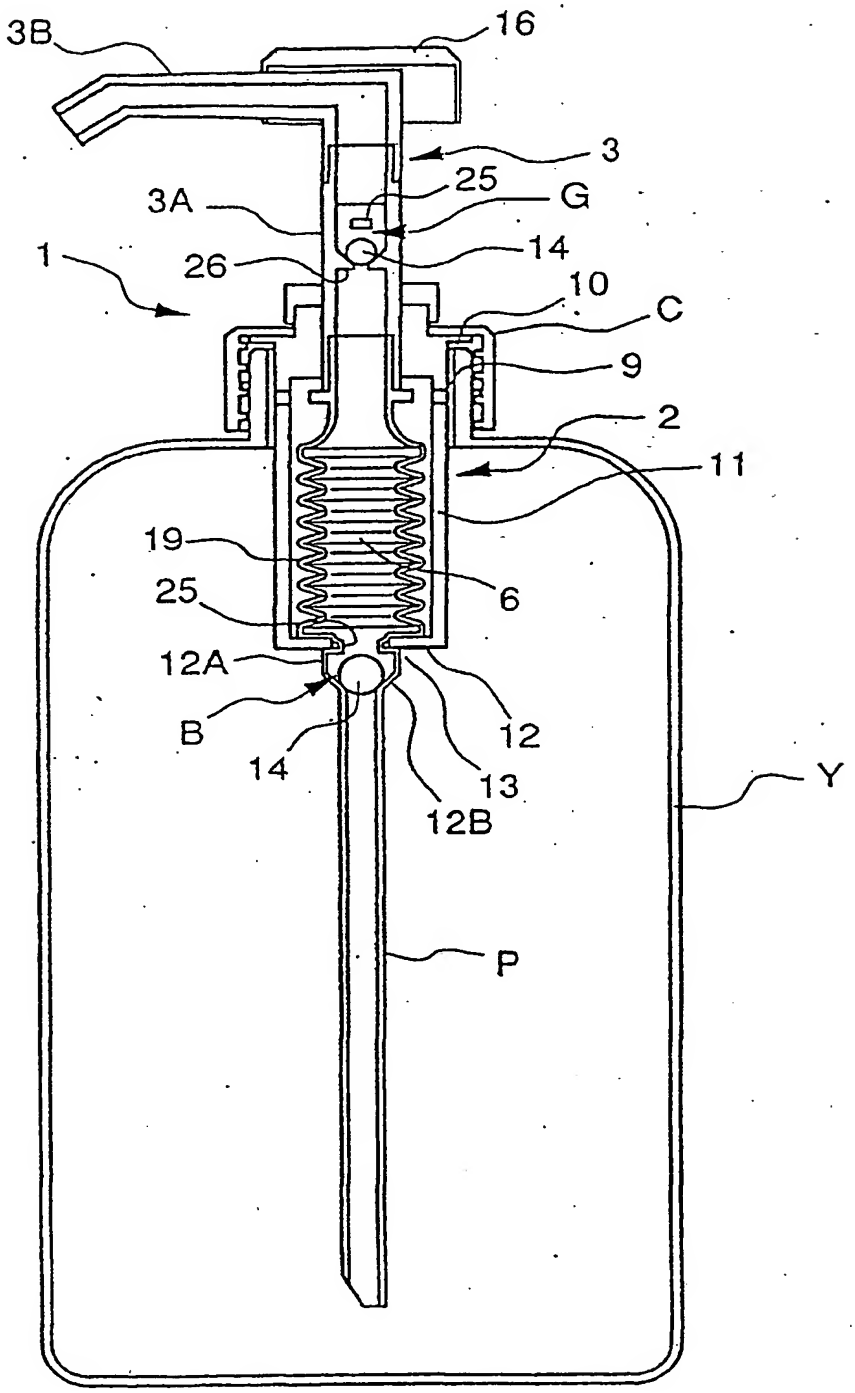


Fig. 11

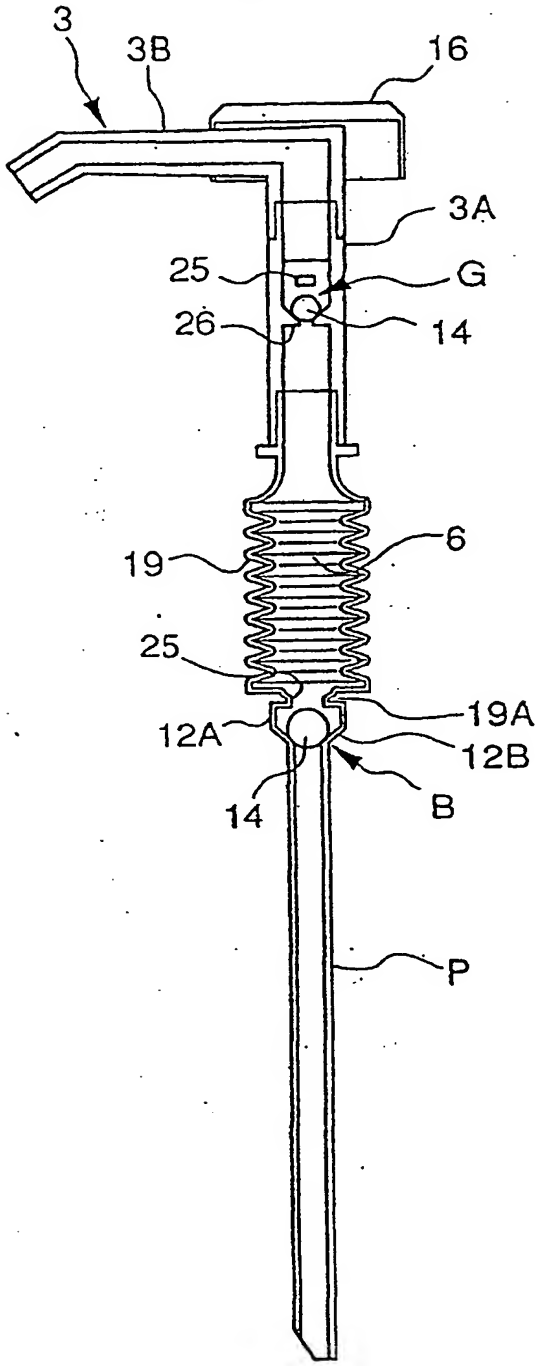


Fig. 15

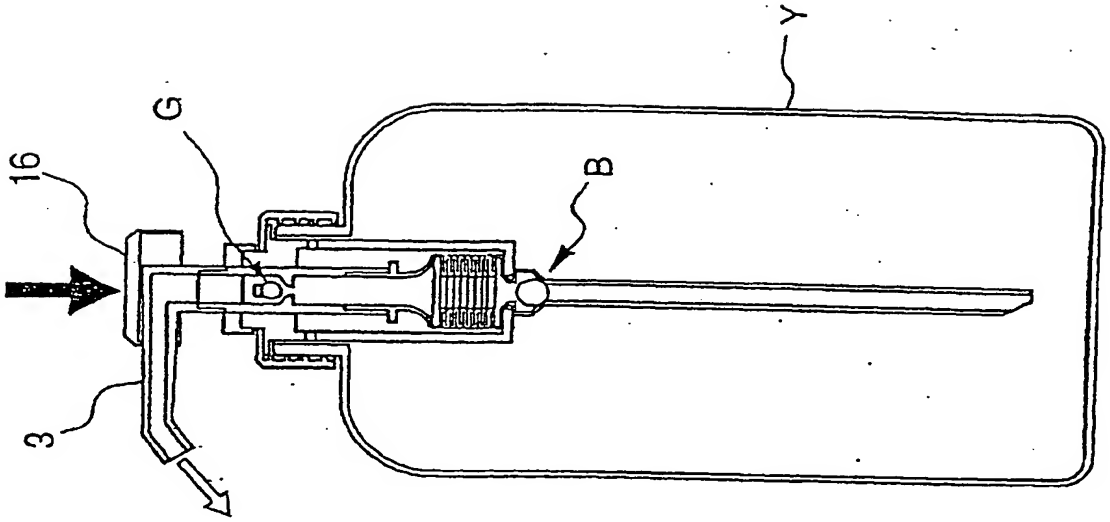


Fig. 14

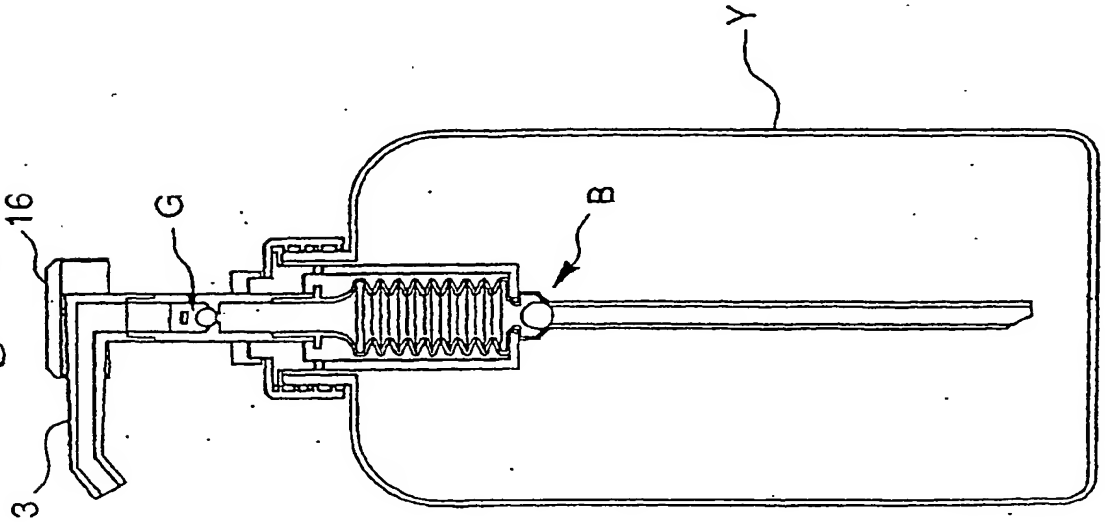


Fig. 18

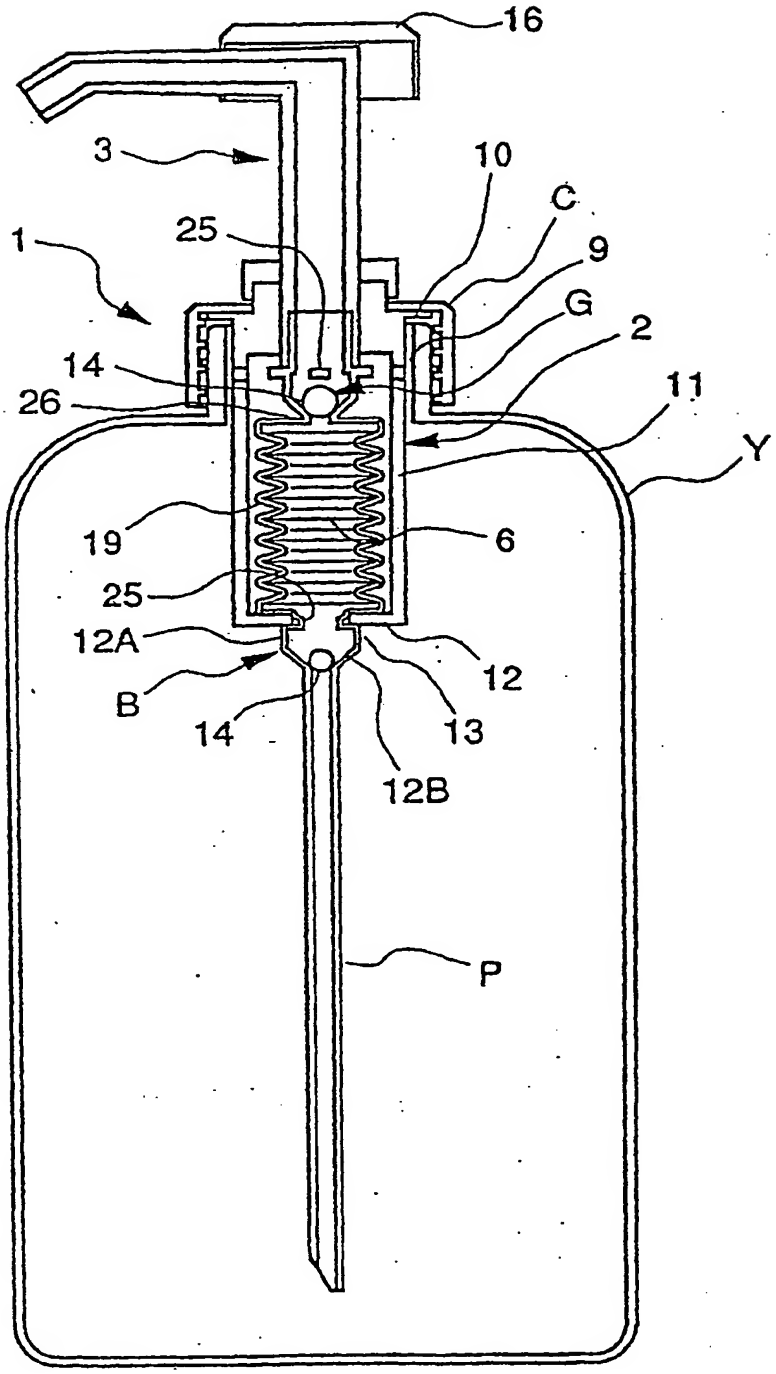


Fig. 20

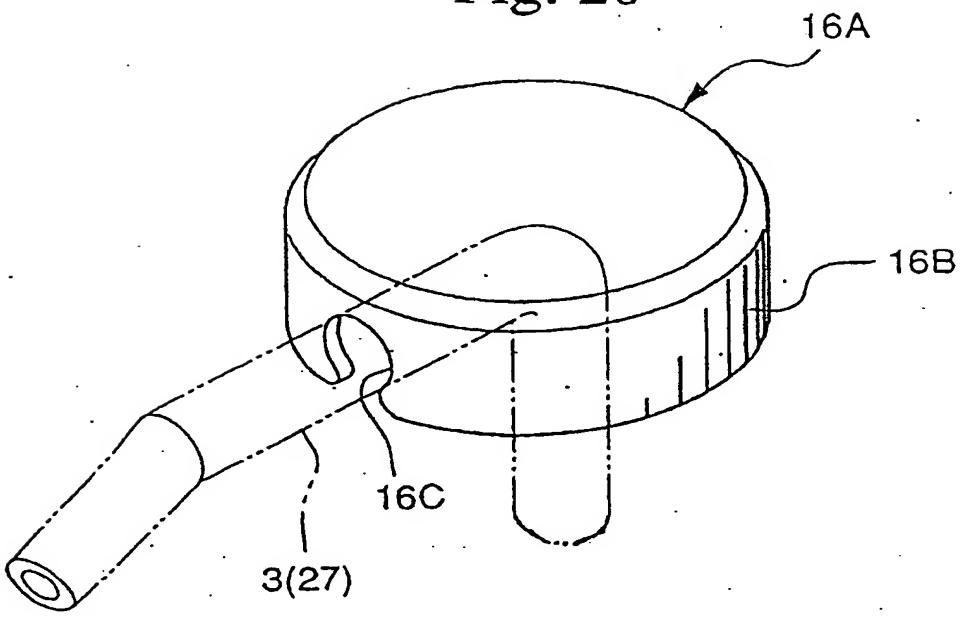


Fig. 21

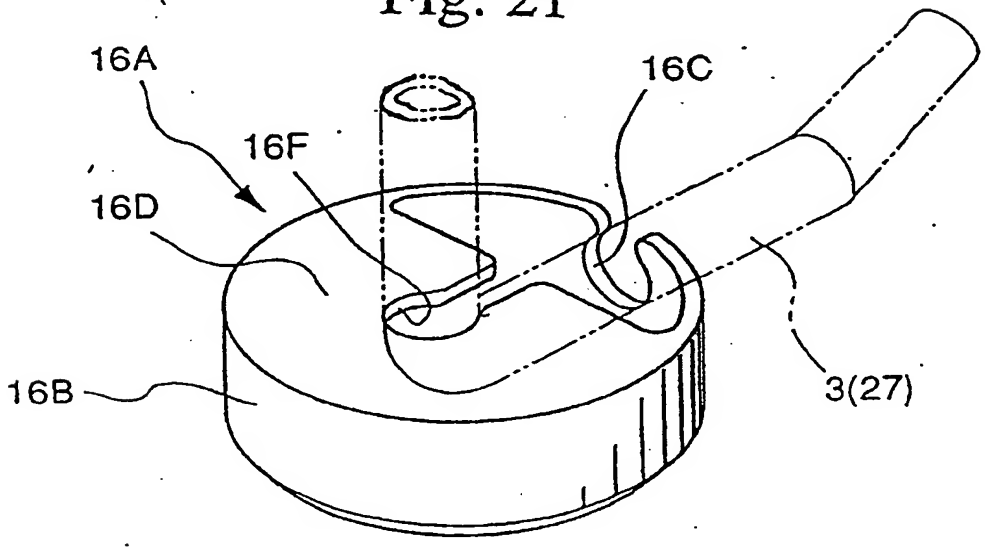


Fig. 23

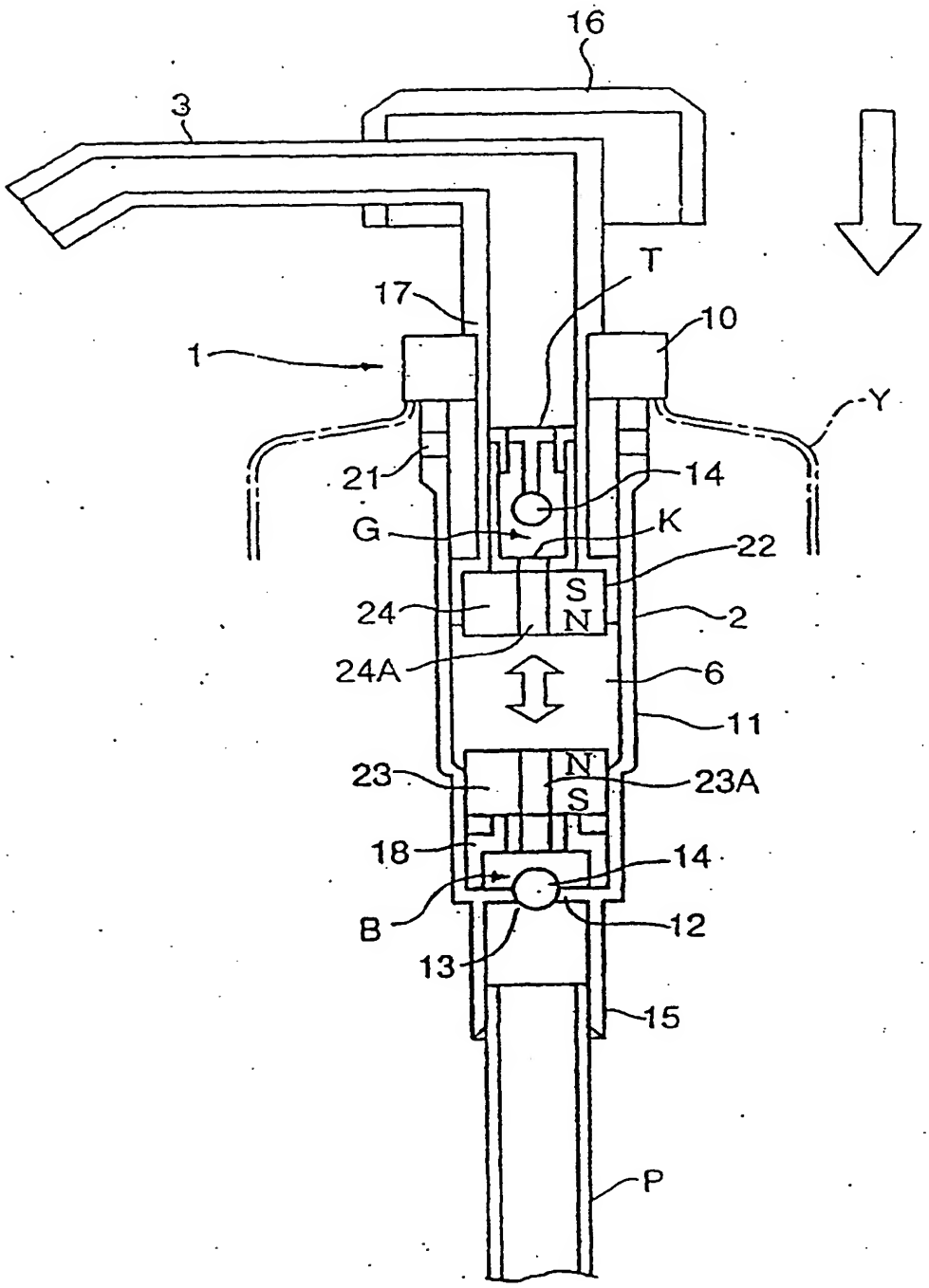


Fig. 25

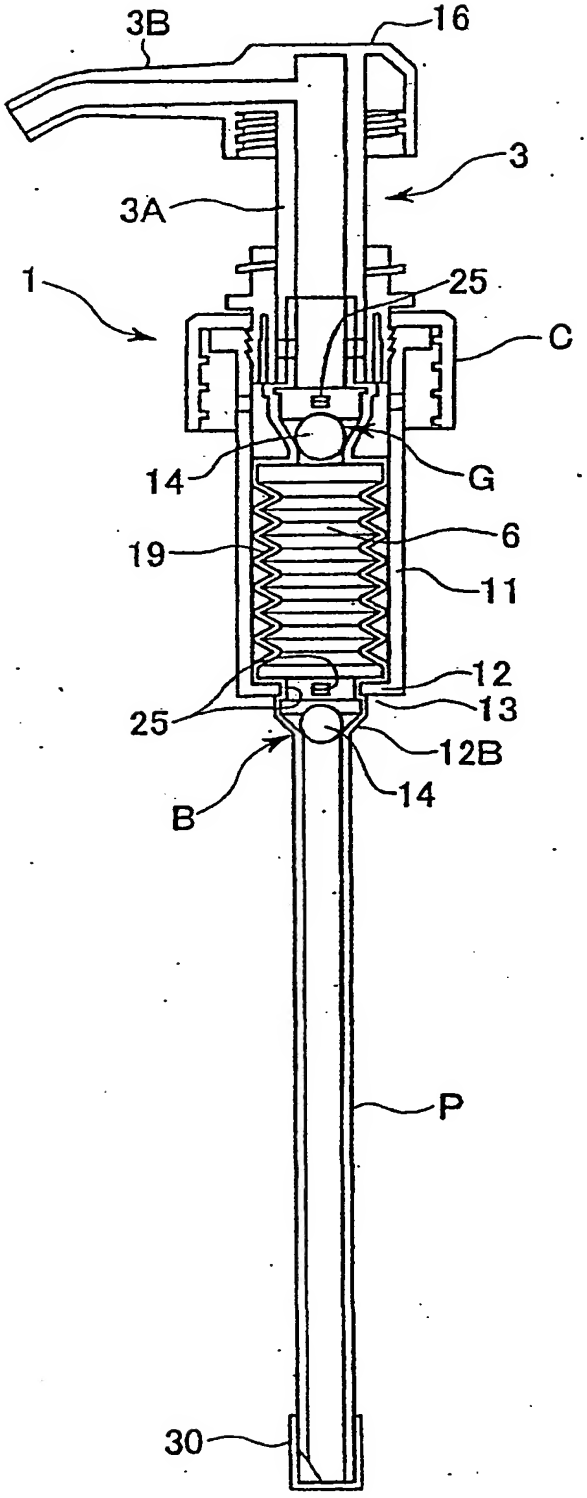
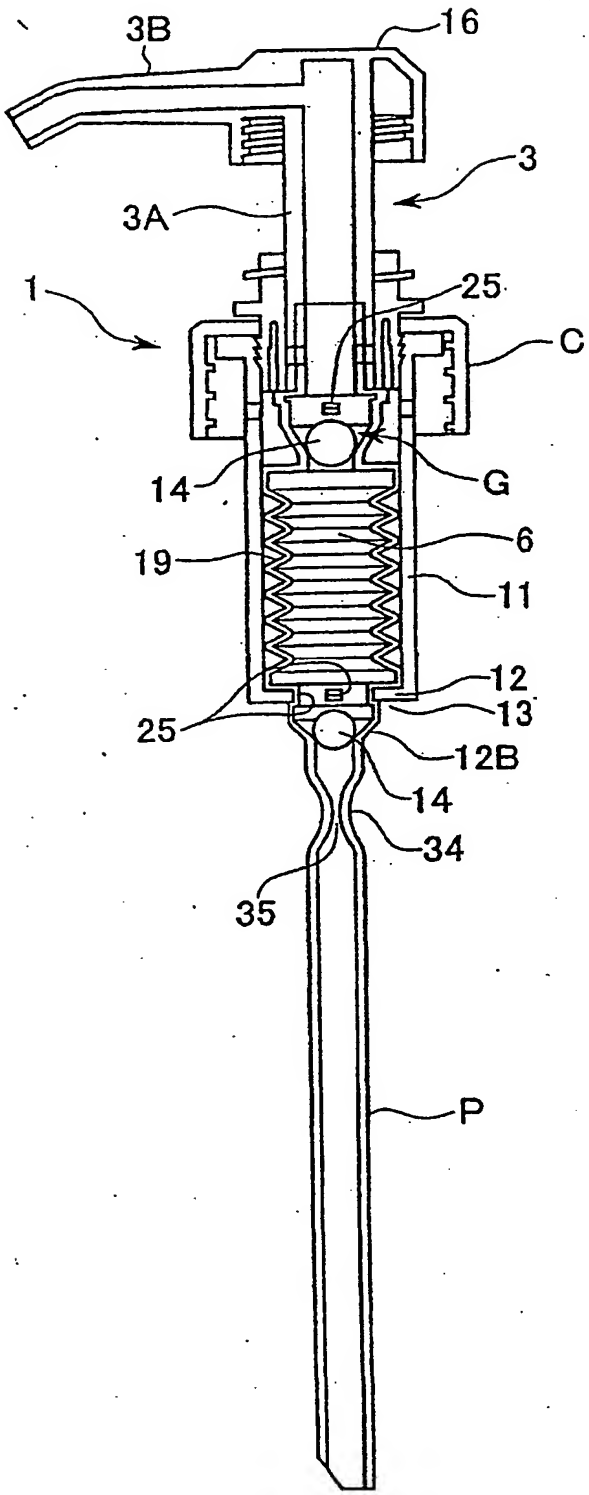
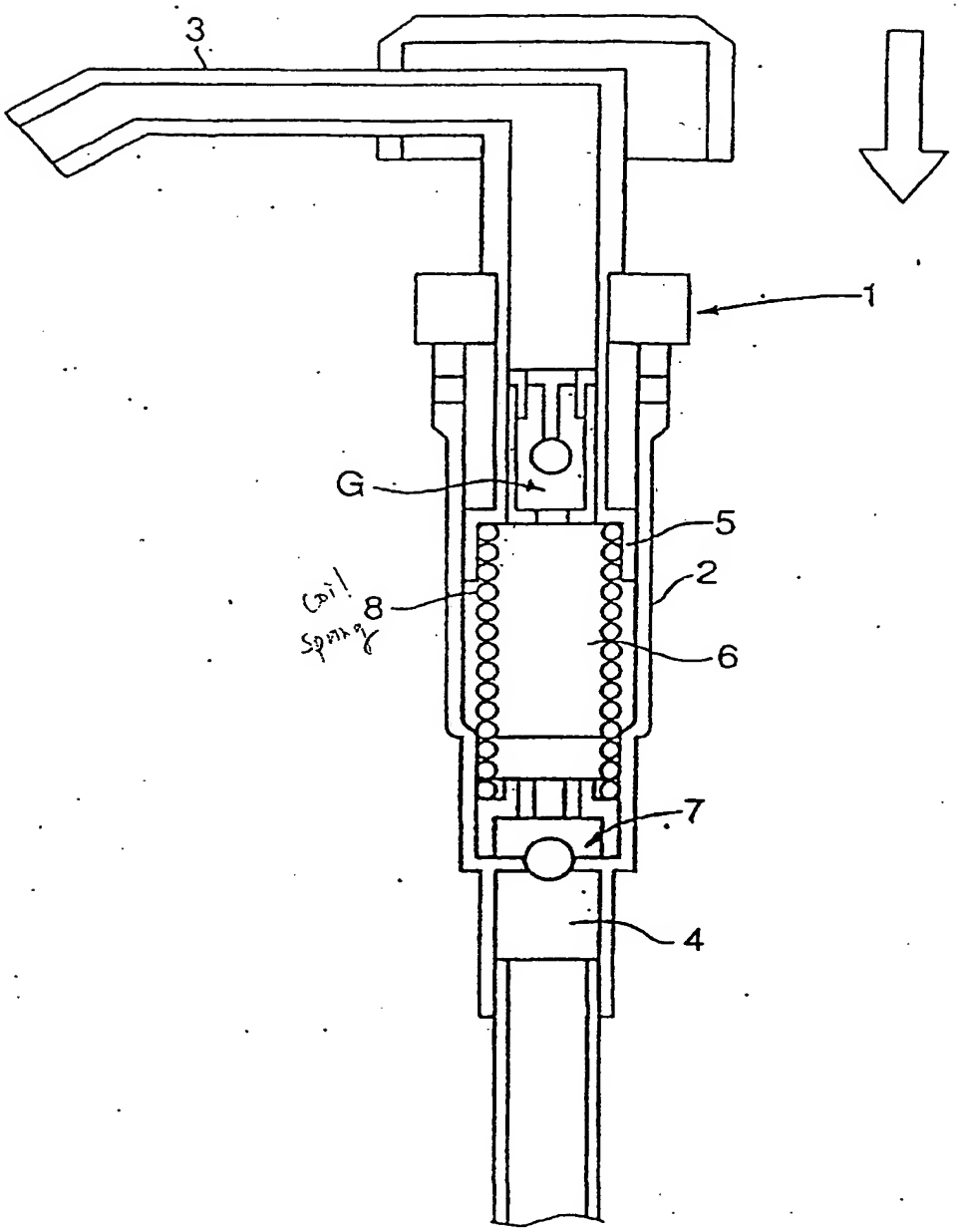


Fig. 28



prior art

Fig. 31



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/04407

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A47K 5/12
B65D 47/34
F04B 9/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] A47K 5/12-5/13
B65D 47/34
F04B 9/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1928-1996 Toroku Jitsuyo Shinan Koho 1994-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Jitsuyo Shinan Toroku Koho 1996-2000

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, 97/42124, A (YOSHINO KOGYOSHO CO., LTD.), 13 November, 1997 (13.11.97), Full text; all drawings & JP, 9-272559, A	1
Y A	Full text; all drawings & EP, 941208, A	2-4,11-14 5-7,10
X	JP, 10-101115, A (Yoshino Kogyosho Co., Ltd.), 21 April, 1998 (21.04.98), Full text; all drawings (Family: none)	1
Y A		2-4,11-14 5-7,10
X	JP, 9-70371, A (Kao Corporation), 18 March, 1997 (18.03.97), Full text; all drawings (Family: none)	8,9
A	EP, 250965, A (Mega-Plast product- und Verpackungsentwicklung Marketing G.m.b.H.& Co.), 07 January, 1988 (07.01.88), Full text; all drawings	1-14

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 September, 2000 (07.09.00)	19 September, 2000 (19.09.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
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